What is claimed is:

1. A magneto-resistance effect element comprising:

a first magnetic substance layer;

a spacer layer stacked on the first magnetic substance layer;

a second magnetic substance layer stacked on the spacer layer;

an insulating layer positioned adjacent to a stacked structure comprising the first magnetic substance layer, the spacer layer and the second magnetic substance layer;

a gate electrode positioned adjacent to the insulating layer, and

a magnetism sensitive region controlled by a voltage applied to the gate electrode.

2. The magneto-resistance effect element according to claim 1, wherein the size of the magnetism sensitive region of at least one of the first and second magnetic substance layers is changed by the voltage applied to the gate electrode.

3. The magneto-resistance effect element according to claim 2, wherein the magnetism sensitive region is narrowed.

4. The magneto-resistance effect element according to claim 2, wherein the magnetic substance layer whose magnetism sensitive region is changed by the voltage applied to the gate electrode includes at least one of group III - V semiconductor crystal, group II - VI semiconductor crystal, group IV semiconductor crystal, chalcopyrite semiconductor crystal and amorphous semiconductor crystal as a base material, and includes at least one of a transition metal element and a rare earth metal element as a magnetic element.

5. The magneto-resistance effect element according to claim 1, wherein the first magnetic substance layer is formed of magnetic semiconductor, and the first magnetic substance layer is put in a paramagnetic state when a voltage is not applied to the gate electrode and the magnetism sensitive region to be put in a ferromagnetic state appears in the first magnetic substance layer when a voltage is applied to the gate electrode.

6. The magneto-resistance effect element according to claim 5, wherein the gate electrode is provided on each of a pair of side portions of the stacked structure opposed to each other, and the magnetism sensitive region appears at an approximately central portion of the first magnetic substance layer when a voltage is applied to the gate electrode.

7. The magneto-resistance effect element according to claim 5, wherein the gate electrode is provided on one of a pair of side portions of the stacked structure opposed to each other, and the magnetism sensitive region appears at an end region of the first magnetic substance layer which is positioned on a side of the gate electrode.

8. The magneto-resistance effect element according to claim 1, wherein the first magnetic substance layer is formed of magnetic semiconductor, and the first magnetic substance layer is put in a ferromagnetic state when a voltage is not applied to the gate electrode, and a magnetism sensitive region which is put in the ferromagnetic state is narrowed when a voltage is applied to the gate electrode.

9. The magneto-resistance effect element according to claim 8, wherein the gate electrode is provided on each of a pair of side portions of the stacked structure opposed to each other, and the magnetism sensitive region appears at an approximately central portion of the first magnetic substance layer when a voltage is applied to the gate electrode.

10. The magneto-resistance effect element according to claim 8, wherein the gate electrode is provided on one of a pair of side portions of the stacked structure opposed to each other, and the magnetism sensitive region appears at an end region of the first magnetic substance layer which is positioned on a side of the gate electrode.

11. The magneto-resistance effect element according to claim 4, wherein the magnetic substance layer where the magnetism sensitive region is changed comprises either one of GaAs, GaN, GaP, GaSb, AlAs, AlN, AlP, AlSb, InAs, InN, InP, and InSb when the base material is group III -V semiconductor crystal.

12. The magneto-resistance effect element according to claim 4, wherein the magnetic substance layer where the magnetism sensitive region is changed comprises either one of ZnSe, MgSe, CdSe, BeSe, ZnS, MgS, CdS, BeS, ZnTe, MgTe, CdTe, BeTe, ZnO, MgO, CdO, and BeO when the base material is group II - VI semiconductor crystal.

13. The magneto-resistance effect element according to claim 4, wherein the magnetic substance layer where the magnetism sensitive region is changed comprises either one of $CdGeP_2$, $CdSnP_2$, $CdSiP_2$, $ZnGeP_2$, $ZnSnP_2$, $ZnSiP_2$, $CdGeAs_2$, $CdSnAs_2$, $CdSiAs_2$, $ZnGeAs_2$, $ZnSnAs_2$, $ZnSiAs_2$, $CuAlS_2$, $CuGaS_2$, $CuInS_2$, $AgAlS_2$, $AgGaS_2$, $AgInS_2$,

$CuAlSe_2$, $CuGaSe_2$, $CuInSe_2$, $AgAlSe_2$, $AgGaSe_2$, $AgInSe_2$, $CuAlTe_2$, $CuGaTe_2$, $CuInTe_2$, $AgAlTe_2$, $AgGaTe_2$, and $AgInTe_2$, when the base material is chalcopyrite semiconductor crystal.

14. The magneto-resistance effect element according to claim 1, wherein the size of an electric conductive region of the spacer layer is changed by a voltage applied to the gate electrode.

15. The magneto-resistance effect element according to claim 14, wherein the conductive region is narrowed.

16. The magneto-resistance effect element according to claim 14, wherein the spacer layer is formed of group III - V semiconductor crystal, group II - VI semiconductor crystal, group IV semiconductor crystal, chalcopyrite semiconductor crystal or amorphous semiconductor crystal.

17. The magneto-resistance effect element according to claim 14, wherein the spacer layer is a semiconductor layer and a resistance value of the spacer layer obtained when a voltage is not applied to the gate electrode is higher than a resistance value thereof obtained when a voltage is applied to the gate electrode.

18. The magneto-resistance effect element according to claim 14, wherein the spacer layer is a semiconductor layer and a resistance value of the spacer layer obtained when a voltage is not applied to the gate electrode is lower than a resistance value thereof obtained when a voltage is applied to the gate electrode.

19. The magneto-resistance effect element according to claim 14, wherein the gate electrode is provided on

at least one side of the stacked structure.